इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

# IS 9959 (1981): Guidelines for iron ore sinters for iron making in blast furnace [MTD 13: Ores and Raw Materials]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

IS : 9959 - 1981

(Reaffirmed 2003)

# *Indian Standard*

# GUIDELINES FOR IRON ORE SINTERS FOR IRON MAKING IN BLAST FURNACES

UDC 622·341·1 — 188·5 : 669·17

© *Copyright* 1982

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

[redacted] Gr 2

*January* 1982

# *Indian Standard*

# GUIDELINES FOR IRON ORE SINTERS FOR IRON MAKING IN BLAST FURNACES

---

## Ores and Raw Materials Sectional Committee, SMDC 16

| *Chairman* | *Representing* |
|---|---|
| SHRI L. D. SAMANT | Chowgule & Co Pvt Ltd, Mormugao Harbour, Goa |
| *Members* | |
| SHRI V. K. AGRAWAL | Hindustan Aluminium Corpn Ltd, Renukoot |
| SHRI S. V. BHAGWAT | The Indian Ferro Alloy Producers Association, Bombay |
| SHRI A. BISWAS | R. V. Briggs & Co (P) Ltd, Calcutta |
| SHRI K. P. DE ( *Alternate* ) | |
| DR AMIT CHATTERJEE | The Tata Iron & Steel Co Ltd, Jamshedpur |
| SHRI V. K. LAKSHMANAN ( *Alternate* ) | |
| SHRI D. CHATTERJEE | Hindustan Zinc Ltd, Udaipur |
| SHRI S. N. BHATNAGAR ( *Alternate* ) | |
| DIRECTOR (CENTRAL PETROLOGY DIVISION ) | Geological Survey of India, Calcutta |
| SHRI S. Y. GHORPADE | The Sandur Manganese & Iron Ores Ltd, Yeshwantnagar |
| SHRI V. K. KALIA ( *Alternate* ) | |
| SHRI S. D. KULPATI | Metallurgical & Engineering Consultants ( India ) Ltd, Ranchi |
| SHRI S. K. MANDAL ( *Alternate* ) | |
| SHRI MANJIT SINGH | Bokaro Steel Plant (SAIL), Bokaro Steel City |
| SHRI M. P. SINHA ( *Alternate* ) | |
| SHRI G. P. MATHUR | National Metallurgical Lab ( CSIR ), Jamshedpur |
| SHRI A. K. MITRA | Mitra S. K. Pvt Ltd, Calcutta |
| SHRI M. N. MITRA ( *Alternate* ) | |
| SHRI M. M. MOUDGILL | Indian Aluminium Co Ltd, Calcutta |
| SHRI K. RAMACHANDRAN ( *Alternate* ) | |
| DR K. S. NARASIMHAN | Regional Research Laboratory (CSIR), Bhubaneshwar |
| SHRI M. I. ANSARI ( *Alternate* ) | |
| SHRI P. S. NARAYANA | Engineering & Mineral Industrial Research Laboratory, Bangalore |
| SHRI P. S. VENKATACHALAPATHY ( *Alternate* ) | |
| DR N. PRASAD | R & D Centre for Iron and Steel (SAIL), Ranchi |
| SHRI T. M. SRINIVASAN ( *Alternate* ) | |
| SHRI S. RANGACHARI | The Minerals and Metals Trading Corpn of India Ltd, New Delhi |

( *Continued on page* 2 )

© *Copyright* 1981
INDIAN STANDARDS INSTITUTION
This publication is protected under the *Indian Copyright Act* ( XIV of 1957 ) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

( *Continued from page* 1 )

| *Members* | *Representing* |
|---|---|
| Shri G. V. U. Rao | Bhabha Atomic Research Centre, Bombay |
| Shri N. K. Rao ( *Alternate* ) | |
| Shri K. V. Rao | Kudremukh Iron Ore Co Ltd, Bangalore |
| Representative | Hindustan Zinc Ltd |
| Shri A. K. Saha | National Test House, Calcutta |
| Shri D. K. Sengupta | M. N. Dastur & Co Pvt Ltd, Calcutta |
| Shri D. S. Basu ( *Alternate* ) | |
| Shri C. K. Shah | Gujarat Mineral Development Corpn Ltd, Ahmadabad |
| Shri S. V. Jhala ( *Alternate* ) | |
| Shri D. K. Sood | Bhilai Steel Plant ( SAIL ), Bhilai |
| Shri N. N. Subrahmanyan | Indian Bureau of Mines, Nagpur |
| Shri K. Satyanarayana ( *Alternate* ) | |
| Shri J. Talwar | Indian Iron & Steel Co Ltd (SAIL ), Burnpur |
| Dr M. M. Chakravarty ( *Alternate* ) | |
| Shri S. D. Varangaonkar | Rourkela Steel Plant ( SAIL ), Rourkela |
| Shri A. B. Srivastava ( *Alternate* ) | |
| Shri S. K. Velingkar | National Mineral Development Corpn Ltd, Hyderabad |
| Shri S. Barpanda ( *Alternate* ) | |
| Shri C. R. Rama Rao, Director ( Struc & Met ) | Director General, ISI ( *Ex-officio Member* ) |

*Secretary*

Shri S. K. Gupta
Assistant Director ( Met ), ISI

## Subcommittee for Physical Tests of Iron Ore, SMDC 16 : 4

| *Convener* | |
|---|---|
| Shri P. S. Narayana | The Engineering & Mineral Industrial Research Laboratory, Bangalore |
| *Members* | |
| Shri D. B. Asthana | National Mineral Development Corpn Ltd, Hyderabad |
| Dr Amit Chatterjee | The Tata Iron & Steel Co Ltd, Jamshedpur |
| Shri V. K. Lakshmanan ( *Alternate* ) | |
| Shri S. K. Dikshit | The Indian Iron & Steel Co Ltd ( SAIL ), Burnpur |
| Shri A. Das ( *Alternate* ) | |
| Shri D. B. Ghosh | Geological Survey of India, Calcutta |
| Shri N. B. Gude | Chowgule & Co Pvt Ltd, Mormugao Harbour, Goa |
| Shri A. Dasouza ( *Alternate* ) | |
| Shri K. N. Gupta | National Metallurgical Laboratory ( CSIR ), Jamshedpur |
| Shri N. Jankiraman | Bokaro Steel Plant ( SAIL ), Bokaro Steel City |
| Shri T. Balasubramaniam ( *Alternate* ) | |
| Shri A. K. Mitra | Mitra S. K. Pvt Ltd, Calcutta |
| Shri M. N. Mitra ( *Alternate* ) | |

( *Continued on page* 6 )

# *Indian Standard*

# GUIDELINES FOR IRON ORE SINTERS FOR IRON MAKING IN BLAST FURNACES

## 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 30 October 1981, after the draft finalized by the Ores and Raw Materials Sectional Committee had been approved by the Structural and Metals Division Council.

**0.2** Sinter is an agglomerated product suitable for charging in the blast furnace obtained by incipient fusion of iron, ore fines along with other constituents, such as, coke breeze, flux, sand, mill scale, flue dust and other metallurgical wastes.

**0.3** This specification refers to iron ore sinter meant for use in the blast furnace. The quality requirements of sinter for use in the blast furnace depend on local factors, for example, type of other burden materials available, size of the furnace, hot metal quality, slag chemistry desired, etc. Also, a compromise on the desired quality may have to be reached in many cases, depending upon the availability and suitability of raw materials for making sinter. Therefore, it is not possible to lay down the complete quality requirements of sinter in a specification such as this. However, certain guidelines as to the requisite properties of iron ore sinter intended for use in the blast furnace have been included.

**0.4** The property requirements of sinter can broadly be classified into the following categories:

a) Chemistry,
b) Size,
c) Physical strength,
d) Reducibility,
e) Behaviour under RUL test,
f) Softening point, and
g) Softening characteristics

**0.5** In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

---

*Rules for rounding off numerical values ( *revised* ).

## 1. SCOPE

**1.1** This standard covers guidelines for iron ore sinters in terms of chemical and physical requirements.

## 2. CHEMICAL COMPOSITION

**2.1** It is well established that superfluxed sinter offers many advantages over both acid and fluxed sinter. The superfluxed sinter besides eliminating/minimising the direct flux to be charged in the blast furnace gives an optimum combination of strength and reducibility which is not possible to achieve in acid or self-fluxed sinter. The basicity of sinter should be such that other properties like strength, and reducibility are compatible for smooth furnace operation. The chemistry of sinter should be indicated by the following :

Total Fe
$CaO$
$SiO_2$
$Al_2O_3$
$MgO$
$FeO$
$MnO$
$P$
$S$

$$\text{Basicity} = CaO/SiO_2 \text{ and/or } \frac{CaO + MgO}{SiO_2}$$

## 3. SIZE

**3.1** The acceptable optimum size of sinter at the blast furnace depends on the size distribution of other feed materials in the blast furnace burden, size of the furnace, furnace operating characteristics (whether the furnace is equipped for high top pressure operation or not), etc. Therefore, it is not possible to specifically quantify the optimum size range. However, the size range should be recorded as follows:

| | |
|---|---|
| + 40 mm | Percent |
| — 40 mm + 25 | Percent |
| — 25 mm + 10 mm | Percent |
| — 10 mm + 5 mm | Percent |
| — 5 mm | Percent |

**3.1.1** However, the +40 mm fraction should not exceed 10 percent and the 5 mm fraction should not exceed 10 percent in a lot.

## 4. STRENGTH

**4.1** The strength of sinter is usually measured in terms of its (a) shatter index and (b) tumbler index. Numerous procedures for measuring these indices are available. Suggested procedures for measuring these indices and the desirable values as per these measurement procedures are indicated in **4.2** and **4.3**.

**4.2 Shatter Index** — The shatter index of sinter when determined in accordance with IS : 9963-1981* shall not be lower than 80 percent.

**4.3 Tumbler Index** — The tumbler index of sinter when determined in accordance with IS : 6495-1972† shall not be less than 65 percent and the abrasion index shall not exceed 6 percent.

## 5. REDUCIBILITY

**5.1** The reducibility of iron ore sinter when determined in accordance with IS : 8167-1976‡ shall not be less than 50 percent.

## 6. BEHAVIOUR UNDER RUL TEST

**6.1** The behaviour shall be determined in accordance with draft Indian Standard Method of determination of behaviour of iron ores, pellets and sinter in the reduction softening test under load ( RUL TEST ) (under preparation ).

## 7. SOFTENING CHARACTERISTIC

**7.1** The softening characteristic of iron ore sinter shall be datermined in accordance with IS : 9660-1980§ with a sample of sinter having a size range of −15 mm + 10 mm.

---

*Method of determination of shatter index of iron ore lumps, sinters and pellets.

†Method of tumbler test for pellets and sized iron ores.

‡Method for determination of reducibility of iron ore and sinter.

§Guidelines for determination of softening characteristics of iron ore pellets.

( *Continued from page* 2 )

| *Members* | *Representing* |
|---|---|
| Shri V. L. N. Murthy | Sponge Iron India Ltd, Paloncha |
| Shri V. M. Dapatardar ( *Alternate* ) | |
| Shri T. R. Ramchandra Rao | Metallurgical & Engineering Consultants (India) Ltd, Ranchi |
| Shri S. K. Mandal ( *Alternate* ) | |
| Shri K. V. Rao | Kudremukh Iron Ore Co Ltd, Bhadravati |
| Shri R. A. Sriman Narayan Das | Visvesvaraya Iron & Steel Ltd, Bhadravati |
| Shri K. Jaganatha Rao ( *Alternate* ) | |
| Dr T. M. Srinivasan | R & D Centre for Iron & Steel (SAIL), Ranchi |
| Shri P. K. Sengupta ( *Alternate* ) | |
| Shri T. A. Subramaniam | Rourkela Steel Plant (SAIL), Rourkela |
| Shri N. N. Subramanyan | Indian Bureau of Mines, Nagpur |
| Shri K. Satyanarayana ( *Alternate* ) | |